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Soil Analysis of Samples from Areas Adjacent to the Truck Gravel Course and Mesa Dust, U.S. Army Yuma Proving Ground

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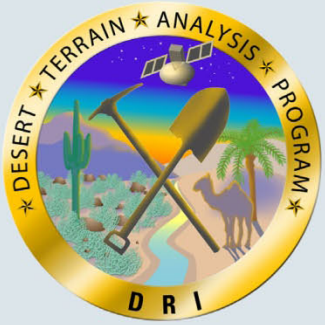

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14. ABSTRACT

This letter report presents a summary of field-related tasks and soil characterization results associated with selected sites at the U.S. Army Yuma Proving Ground (YPG). The investigation included the identification of dust-rich sites in the vicinity of several widely-used vehicle testing courses. Five samples were collected for particle size analysis from a total of two alluvial fan units: Qf1 and Qf2. Results indicate both alluvial fan units (Qf1 and Qf2) have abundant fines typical of a relatively old desert pavement soil – finer material underlain by a gravel rich B-horizon. This analysis indicates that the selected sites would constitute adequate testing locations for dusty, unimproved road conditions.

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Natural Environments Test Office
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October 27, 2008
Revised: August 24, 2010

RE: Soil Analysis of Samples from Areas Adjacent to the Truck Gravel Course and Mesa Dust, U.S. Army Yuma Proving Ground

Dear Mr. Stullenbarger:

This letter report presents a summary of field-related tasks and soil characterization results associated with selected sites at the U.S. Army Yuma Proving Ground (YPG) at the request of you under contract: W9124R-05C-0135/CLIN 0001-ACRN-AA. The investigation included the identification of dust-rich sites in the vicinity of the Truck Gravel Course near the Hot Weather Test Track, and an additional soil sample site referred to as Mesa Dust. The soil sample sites from adjacent to the Truck Gravel Course were identified by Mr. Steven Bacon (DRI), and soil sampling was performed by Mr. John Hawk (NETO–YPG) on September 10-11, 2008. Five samples were collected for particle size analysis. Two alluvial fan units were sampled: Qf1 and Qf2 adjacent to the Gravel Truck Course (Figure 1). At each site, two soil samples were collected at having depths between 0-6 and 6-12 inches, respectively. A fifth sample was collected from Mesa Dust Course, as well.

All soils sampled in this investigation were analyzed in the DRI Soil Characterization and Quaternary Pedology Laboratory. Soil samples were oven dried at 105°C for 24 hours and the gravel fraction (>2mm) removed. All laboratory analysis was preformed on the fine earth

fraction (<1mm). Laboratory measurement of particle size distribution or soil texture was determined using laser diffraction techniques.

Results indicate both alluvial fan units (Qf1 and Qf2) have abundant fines typical of a relatively old desert pavement soil – finer material underlain by a gravel rich B-horizon. Of note, the gravel content from 6-12" is 43.3% on the Qf2, and total clay is 29.4% from 0-6" on the Qf1 (Table 1). As such, the Qf1 may contain an overall greater percentage of finer-grained material. Detailed particle size distributions of the fine-earth fraction (<2mm) are presented in Table 2. Textural analysis of the particle size distributions (<2mm) indicate that the soils are primarily silt loams (Figure 2). The Mesa Dust sample is loam while the surface sample from the Qf1 unit is a silty clay loam.

Conclusion

The desert landscape is a complex mosaic of landforms of variable ages and therefore, contrasting soil conditions and varying geotechnical properties. The surface and subsoils of both the Qf1 and Qf2 alluvial fan units having a well-developed desert pavement, as well as the Mesa Dust sample site, have a sufficient amount of dust and gravel to provide dusty unimproved road conditions. We hope this reconnaissance-level investigation of soils adjacent to the Truck Gravel Course will provide useful soil information to support the expansion of the course area.

If you have any questions please feel free to contact us.

Sincerely,

Todd G. Caldwell, M.S.
Assistant Research Soil Scientist

Steven N. Bacon, M.S.
Assistant Research Geomorphologist

Attachments

2 Tables
2 Figures

Table 1. Soil moisture, gravel, and TOTAL particle size distribution results for YPG gravel courses

		MOISTURE	GRAVEL	SAND	SILT	CLAY
Lab ID #	Field ID	g g^{-1}	>2 mm	2000 - 62.5 µm	62.5 - 3 µm	<3 µm
		- % -	- % -	- % -	- % -	- % -
09-199	Gvrl Qf1-0"	0.02	16.5	12.8	41.3	29.4
09-200	Gvrl Qf1-6"	0.04	22.2	15.1	47.2	15.6
09-201	Gvrl Qf2-0"	0.03	13.2	23.2	44.6	18.9
09-202	Gvrl Qf2-6"	0.03	43.3	17.2	29.2	10.3
09-203	Mesa Dust	0.03	8.2	34.8	41.7	15.3

Table 2. Particle size distribution results for the fine earth fraction (<2mm)

		SAND					SILT		CLAY
Lab ID #	Field ID	>1000 µm	500 µm	250 µm	125 µm	62.5 µm	15 µm	3 µm	<3 µm
		- % -	- % -	- % -	- % -	- % -	- % -	- % -	- % -
09-199	Gvrl Qf1-0"	9.1	0.0	0.6	1.8	3.7	22.0	27.5	35.3
09-200	Gvrl Qf1-6"	15.1	0.0	0.2	0.6	3.6	28.1	32.6	20.0
09-201	Gvrl Qf2-0"	8.5	0.0	0.5	4.0	13.8	28.7	22.8	21.8
09-202	Gvrl Qf2-6"	15.7	0.0	0.8	3.2	10.7	29.6	21.9	18.1
09-203	Mesa Dust	9.0	0.0	5.5	9.7	13.7	23.6	21.8	16.7

Figure 1. Soil sample locations of Qf1 and Qf2 alluvial fan units adjacent to the Truck Gravel Course.

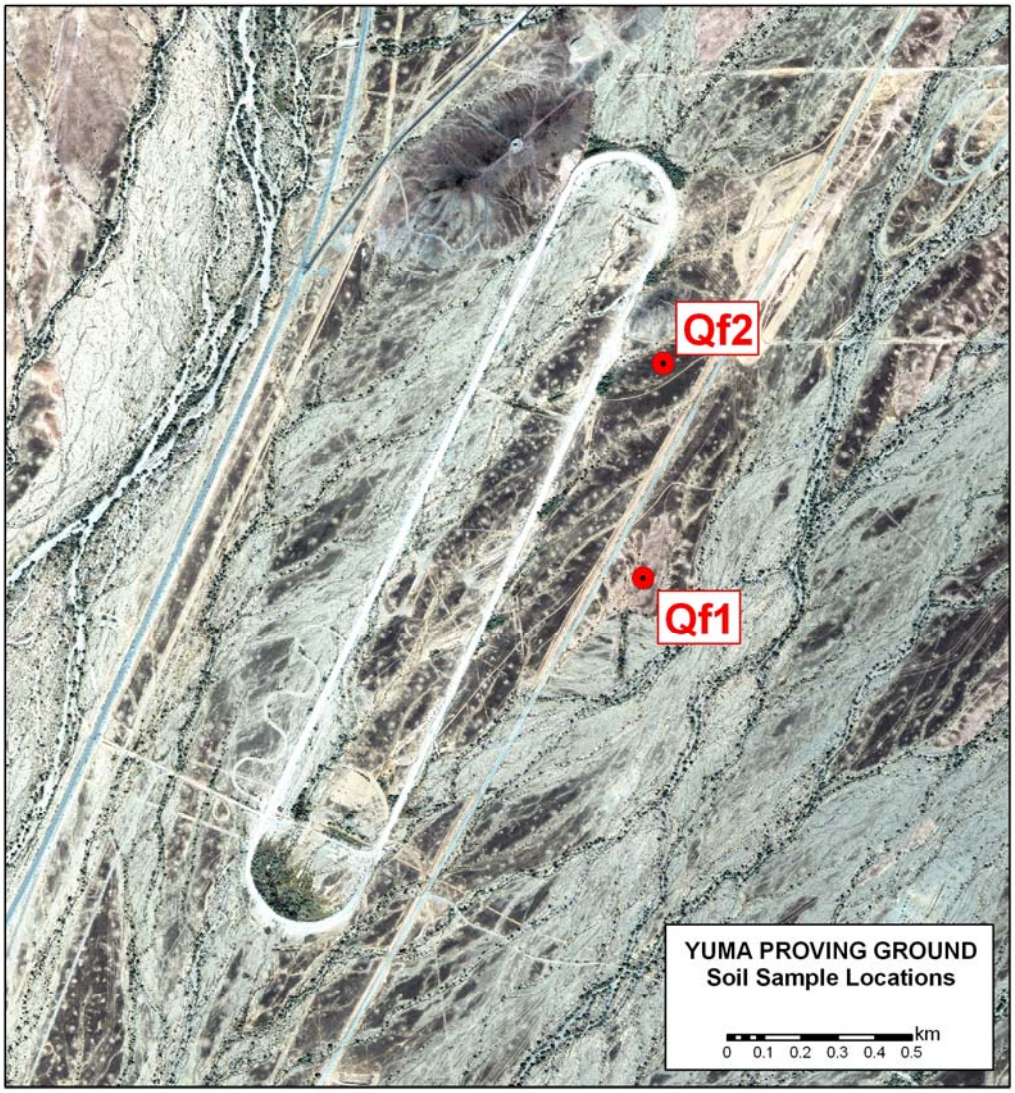

Figure 2. Ternary diagram for the fine earth fraction (<2mm).